Check List the journal of biodiversity data

NOTES ON GEOGRAPHIC DISTRIBUTION

Check List 11(3): 1649, May 2015 doi: http://dx.doi.org/10.15560/11.3.1649
ISSN 1809-127X

A coastal population of Large-blotched Ensatina (Caudata: Plethodontidae: *Ensatina eschscholtzii klauberi*) in Baja California, México

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Abstract: A new population of *Ensatina eschscholtzii klauberi* in the San Quintín volcanic field, Baja California, represents the first coastal population of this taxon. This record extends the range ca. 71 km southwest of the southernmost record of *E. e. klauberi* in the Sierra San Pedro Mártir and represents the first population discovered outside of coniferous and pine-oak woodlands.

Key words: salamander, distribution, habitat, volcanic field, San Quintín

The Large-blotched Ensatina (*Ensatina eschscholtzii klauberi* Dunn 1929) is a medium-sized plethodontid salamander (Petranka 1998) and one of four salamanders found in Baja California, México (Grismer 2002). *Ensatina e. klauberi* ranges disjunctly from the eastern Transverse Ranges of southern California, USA, southward through the northern Peninsular Ranges in Baja California, México, with isolated montane populations in the San Bernardinos, San Jacintos, Santa Rosas, Palomars, Hot Springs, Cuyamacas, and Lagunas in the United States and the Sierra Juárez and Sierra San Pedro Mártir in México (Jackman and Wake 1994; Mahrdt et al. 1998; Heim et al. 2005; Devitt et al. 2013). It is a part of the wider-ranging *E. eschscholtzii* complex that has been treated by some as multiple subspecies and others as different species (Tilley et al. 2012). Within its range, *E. e. klauberi* inhabits moist evergreen and mixed conifer forests and oak woodlands (Hammerson et al. 2004), at elevations from 520 to 2,400 m (Jennings and Hayes 1994; Mahrdt et al. 1998), and is commonly found under rocks, logs and other debris (Stebbins 2003).

We discovered a coastal population of *Ensatina eschscholtzii klauberi* at Volcán Riveroll, in the San Quintín volcanic field, Baja California (30.49008° N, 116.01576° W, elevation 70 m), which represents the first population recorded from habitat other than coniferous and pine-oak woodlands. This population was first reported by Devitt et al. (2013), who used genetic samples from Volcán Riveroll as part of a broader analysis of *E. e. klauberi*. In this report, we expand on the details of the discovery and provide a description of the population and its possible origins.

The San Quintín volcanic field lies along the Pacific coast of Baja California, about 260 km south of the U.S. border and consists of late Pleistocene to Holocene volcanic complexes (Storey et al. 1989; Luhr et al. 1995). The volcanic field contains xenoliths of upper mantle peridotites and lower crustal granulites making it unique within Baja California (Luhr et al. 1995). The vegetation at the site is comprised of coastal succulent scrub species (González-Abraham et al. 2010) dominated by *Rhus integrifolia*, *Aesculus parryi*, *Encelia californica*, *Euphorbia misera* and *Selaginella bigelovii* (Figure 1).

Figure 1. Habitat of the coastal population of *Ensatina eschscholtzii klauberi* in the San Quintín volcanic field, Baja California, México, located 3 km from the Pacific Ocean. Photo by Dustin Wood.

Figure 2. Subadult *Ensatina eschscholtzii klauberi* (UABC 1155) from Volcán Riveroll in the San Quintín volcanic field, Baja California, México. Photo by JHVV.

Figure **3:** Adult *Ensatina eschscholtzii klauberi* (UABC 2060) from Volcan Riveroll. Photo by BDH.

On 7 March 2004, during the rainy season, we discovered a subadult *Ensatina eschscholtzii klauberi*, (Figure 2) under a small rock on the northeastern face of the Volcán Riveroll. Five additional specimens were later collected: four subadults between 13–25 March and one adult male (Figure 3) on 22 November 2004. The Snout-vent length (SVL) of the subadult specimens averaged 35.6 mm and ranged from 31.5 to 39.5 mm. The SVL in the adult male was 69.5 mm. Two subadults were found in crevices and the rest under rocks. Tissue samples from these specimens were included in Devitt et al. (2013).

These records extend the range of *Ensatina eschscholtzii klauberi* southward ca. 71 km SW from La Tasajera, Sierra San Pedro Mártir (Mahrdt et al. 1998; Figure 4). The specimens were collected under permit SEMARNAT FLOR 0016 (SGPA/DGVS/7528) and deposited in the herpetological collection of Facultad de Ciencias, Universidad Autónoma de Baja California at Ensenada, Baja California, México (UABC 1155, 2032-2035, 2060). Its distribution has also been updated in the Amphibian and Reptile Atlas of Peninsular California (herpatlas.sdnhm.org). Clark R. Mahrdt verified all specimens. Also found at the site were the salamander *Batrachoseps major*, the lizards *Elgaria multicarinata*, *Plestiodon skiltonianus*, *Uta stansburiana*, and the snakes *Crotalus ruber* and *Pituophis catenifer*.

Ensatina eschscholtzii klauberi was previously thought to be restricted to higher elevations containing pine-oak woodlands. In Baja California, prior to this report, only two highly disjunct and isolated populations were known. These populations occur in the coniferous forest at 2,400 m in La Tasajera, Sierra San Pedro Mártir (Mahrdt et al. 1998) and the pine-oak forest between 1,540–1,602 m in the Sierra Juárez (Heim et al. 2005). The discovery of an *E. e. klauberi* population in coastal succulent scrub vegetation on a volcanic landscape was unexpected and represents the lowest elevation from which this subspecies has been reported. The region lies just 3 km from the Pacific Ocean and is a transitional area between the Mediterranean ecosystem and the deserts of the central peninsula (Garcillan et al. 2012). A significant amount of moisture comes from coastal fog, marine spray and cloudy weather due to the strong upwelling of cold ocean water (Garcillan et al. 2012) and onshore winds in the San Quintín area. These weather patterns may be a contributing factor to the ability of *E. e. klauberi* to persist in this atypical habitat and low elevation.

Lack of records from the Sierra San Pedro Mártir by Welsh (1988) and the absence of suitable habitat based

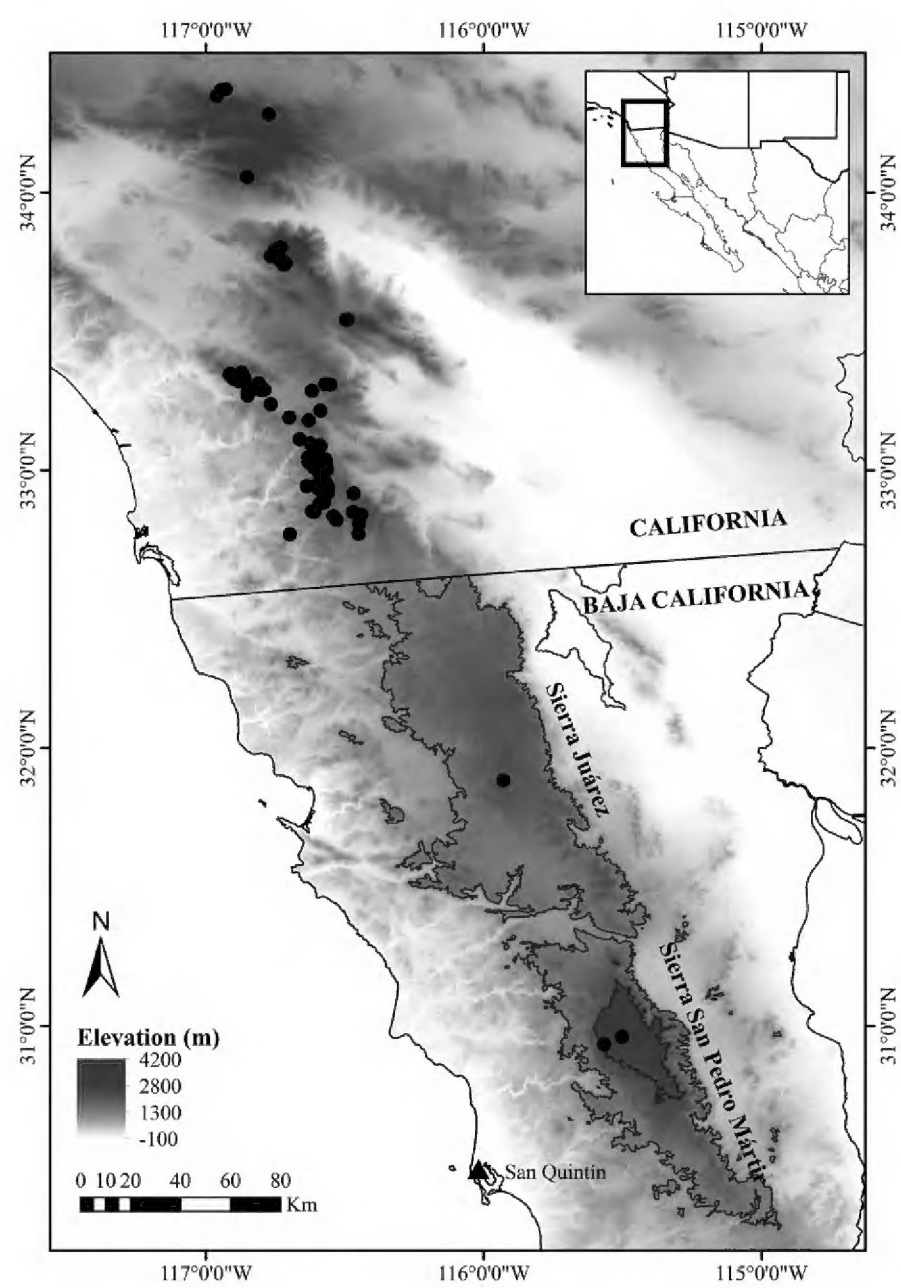

Figure 4. Distribution of *Ensatina eschscholtzii klauberi* in California and Baja California. Dots are the montane populations. The triangle represents the coastal population in the San Quintín volcanic field.

on distribution models between the San Quintín volcanic field and its nearest population in Sierra San Pedro Mártir (Devitt et al. 2013), creates a disjunct distributional pattern in Baja California. Two biogeographic scenarios can be hypothesized to explain this disjunct pattern: a dispersal event or a range contraction resulting in relictual isolates. Because this small amphibian is unlikely to disperse across dry coastal mesas and adjacent foothills, we favor a hypothesis resulting from range contraction. Under these circumstances, we believe the subspecies was once more broadly distributed and became isolated as a result of climate change during the late Pleistocene and Holocene, when more mesic conditions were replaced by a xeric environment. This hypothesis is supported by distributional modeling and genetics, which show that populations from the southern portion of their distribution in Baja California are more deeply divergent from those in the north (Devitt et al. 2013). Pleistocene distributional modeling predicts highly fragmented populations in Baja California with more stable refugia occurring in the mountains in the United States (Devitt et al. 2013).

Similar disjunct distributions also occur in *Sceloporus vandenburgianus* and *Lampropeltis zonata* in the Sierra Juárez and Sierra San Pedro Mártir (Grismer 2002; Heim et al. 2005). Other species with disjunct distributions in northern Baja California include *Sceloporus occidentalis* and *Elgaria multicarinata* (Grismer and Mellink 1994; Grismer 2002). These disjunct patterns all occur along the species' southern range boundary, and while they vary in specific location, each has been characterized as relictual as a result of range contractions (Grismer 2002). For the San Quintín population of *Ensatina eschscholtzii klauberi*, their establishment likely originated after the volcanic eruptions, which date between 20,000 to 180,000 years ago (Luhr et al. 1995).

ACKNOWLEDGEMENTS

We thank Alejandro Blanco, Emma Flores, and Dustin Wood for their help in the field and Angel Guillen for his assistance in the identification of the plants at Volcán Riveroll. To Ross MacCulloch and one anonymous reviewer for their comments and suggestions on the manuscript.

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Authors' contribution statement: All authors contributed equally on all stages of this research.

Received: March 2015
Accepted: April 2015
Editorial responsibility: Ross MacCulloch